CLAIMS

What is claimed is:

1. A method of accomplishing separation of a multiple-component fluid mixture comprising:

feeding the fluid mixture into a chamber of a vessel through an inlet channel, the chamber being at least partially bounded by a peripheral wall and the chamber also communicating with an outlet channel, the fluid mixture including a heavy component and a light component;

rotating the vessel about a rotational axis extending through the vessel such that the heavy component collects toward at least a portion of the peripheral wall of the vessel radially outward from the rotational axis and the light component collects toward the rotational axis, a plurality of spaced apart fins being disposed within the chamber, each fin projecting from toward the rotational axis to toward the peripheral wall, at least a portion of the fluid mixture being disposed between the plurality of fins during rotation of the vessel;

removing the light component through the outlet channel; and

removing the heavy component through a conduit disposed within the chamber, the conduit extending from the heavy component toward the rotational axis and out of the vessel.

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2. A method according to claim 1, further comprises:

removing the light component substantially continuously from the rotating vessel; and

removing the heavy component intermittently from the rotating vessel.

3. A method according to claim 1, further comprises:

removing the light component substantially continuously from the rotating vessel; and

removing the heavy component substantially continuously from the rotating vessel.

4. A method according to claim 1, wherein the act of feeding the fluid mixture into the chamber includes the light component comprising a fluid and the heavy component comprising solid particulate matter.

5. A method according to claim 1, further comprising pressurizing the fluid mixture within the chamber.

6. A method according to claim 1, wherein the fluid mixture is pressurized within the chamber in a range between about 75 psi to about 125 psi.

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7. A method according to claim 1, wherein a disc outwardly projects from toward the rotational axis to toward the peripheral wall, the disc intersecting with each of the plurality of fins, the fluid mixture being feed into the chamber such that fluid mixture is forced to travel around an outer perimeter of the disc.

8. A method according to claim 1, wherein a disc outwardly projects from toward the rotational axis to toward the peripheral wall, the disc intersecting with each of the plurality of fins and the disc having a plurality of openings extending therethrough, the fluid mixture being feed into the chamber such that at least a portion of fluid mixture passes through the openings in the disc.

9. A method according to claim 1, further comprising rotating the fluid within the inlet channel in the same direction that the vessel rotates prior to feeding the fluid mixture into the vessel.

10. A method according to claim 1, wherein an opening is formed in each fin such that an annular fluid equalizing channel provides fluid communication between each of the areas bounded by the fins, the fluid mixture being feed into the chamber of the vessel such that at least a portion of the fluid travels within the fluid equalizing channel.

11. A method according to claim 1, wherein at least a portion of the inlet channel, outlet channel, and conduit encircle a corresponding length of the rotational axis.

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12. A method according to claim 1, wherein the act of feeding a fluid mixture comprises feeding a mixture of oil which corresponds to the light component and water which corresponds to the heavy component into the chamber of the vessel.

13. A method according to claim 1, wherein the fluid mixture comprises a heavy fluid component, a light fluid component, and particulate matter, at least a portion of the particulate matter settling against the peripheral wall of the vessel due to the rotation of the vessel, the method further comprising feeding a removal stream of fluid into the rotating vessel such that the removal stream initially mixes with the heavy fluid component at or adjacent to the peripheral wall, the removal stream resuspending the particulate matter settled against the peripheral wall into the heavy fluid component.

14. A method according to claim 4, wherein at least a portion of the particulate matter settles against the peripheral wall of the vessel due to the rotation of the vessel, the method further comprising feeding a removal stream of fluid into the rotating vessel such that the removal stream initially mixes with the fluid light component at or adjacent to the peripheral wall, the removal stream resuspending the particulate matter settled against the peripheral wall into the fluid light component.

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15. A method of accomplishing separation of a multiple-component fluid mixture comprising:

feeding the fluid mixture into a chamber of a vessel through an inlet disposed at a first end of the vessel, the fluid mixture including a heavy component and a light component, the vessel having an opposing second end with an first outlet disposed thereat and a peripheral wall extending between the first end and the opposing second end;

rotating the vessel about a rotational axis extending through the vessel such that the heavy component collects toward at least a portion the peripheral wall of the vessel radially outward from the rotational axis and the lighter component collects toward the radial axis, a plurality of spaced apart fins being disposed within the chamber, the fins bounding a plurality of fluid channels that extend at least partially between the inlet and the first outlet;

removing the light component through the first outlet; and

removing the heavy component through a plurality of extraction tubes, each extraction tube being disposed within a corresponding fluid channel and extending from toward the rotational axis to toward the peripheral wall.

16. A method as recited in claim 15, wherein at least one of the extraction tubes bounds a second outlet that is disposed at a distance from the rotational axis, the first outlet being disposed closer to the rotational axis than the second outlet such that during use a fluid boundary line is formed between the first outlet and the second outlet

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17. A method according to claim 15, further comprises:

removing the heavy component substantially continuously from the rotating vessel; and

removing the light component intermittently from the rotating vessel.

18. A method according to claim 15, wherein the act of feeding the fluid mixture into the chamber includes the light component comprising a fluid and the heavy component comprising a fluid, solid particulate matter, or combinations thereof.

19. A method according to claim 15, further comprising pressurizing the fluid mixture within the chamber in a range between about 15 psi to about 600 psi.

20. A method according to claim 15, wherein a disc outwardly projects from toward the rotational axis to toward the peripheral wall, the disc intersecting with each of the plurality of fins, the fluid mixture being feed into the chamber such that fluid mixture is forced to travel around an outer perimeter of the disc.

21. A method according to claim 15, wherein a disc outwardly projects from toward the rotational axis to toward the peripheral wall, the disc intersecting with each of the plurality of fins and the disc having a plurality of openings extending therethrough, the fluid mixture being feed into the chamber such that at least a portion of fluid mixture passes through the openings in the disc.

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22. A method according to claim 15, wherein an opening is formed in each fin such that an annular fluid equalizing channel provides fluid communication between each of the areas bounded by the fins, the fluid mixture being feed into the chamber of the vessel such that at least a portion of the fluid travels within the fluid equalizing channel.

23. A method according to claim 15, wherein the inlet and the first outlet of the vessel encircle the rotational axis or have the rotational axis extending therethrough.

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24. A method for separating particulate matter from a fluid in which the particulate matter is suspended, the method comprising:

feeding a fluid containing a particulate matter into a chamber of a vessel through an inlet, the chamber being at least partially bounded by a peripheral wall and the chamber also communicating with an outlet;

rotating the vessel about a rotational axis extending through the vessel such that at least a portion of the particulate matter settles out of the fluid and against at least a portion of the peripheral wall of the vessel;

delivering a stream of removal fluid into the rotating vessel at or adjacent to the peripheral wall such that delivery of the removal stream into the vessel causes at least a portion of particulate matter settled against the peripheral wall to resuspend within the fluid;

removing at least a portion of the fluid having the resuspended particulate matter therein from the vessel through an extraction tube, the extraction tube having an opening to receive the fluid at or adjacent to the peripheral wall; and

removing through the outlet of the vessel the fluid from which the particulate material has settled out.

25. A method according to claim 24, wherein the act of feeding includes the fluid comprising a heavy fluid component and a light fluid component.

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26. A method according to claim 24, wherein the removal fluid is delivered to the vessel through a supply duct formed in the extraction tube and the fluid having the resuspended particulate matter therein is removed through a removal duct in the extraction tube.

27. A method according to claim 26, wherein one of the supply duct and removal duct is disposed within the other.

28. A method according to claim 24, wherein the removal fluid is delivered to the vessel and the fluid having the resuspended particulate matter therein is removed from the vessel through the same duct formed in the extraction tube.

29. A method according to claim 24, further comprising pressurizing the fluid within the chamber in a range between about 15 psi to about 600 psi.

30. A method according to claim 24, wherein a plurality of spaced apart fins are disposed within the chamber of the vessel, the fins bounding a plurality of fluid channels that extend between the inlet and the outlet, the fluid being feed into the chamber of the vessel such that at least a portion of the fluid passes through the fluid channels.

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31. A method according to claim 30, wherein a disc outwardly projects from toward the rotational axis to toward the peripheral wall, the disc intersecting with each of the plurality of fins, the fluid being feed into the chamber such that fluid is forced to travel around an outer perimeter of the disc.

32. A method according to claim 30, wherein a disc outwardly projects from toward the rotational axis to toward the peripheral wall, the disc intersecting with each of the plurality of fins and the disc having a plurality of openings extending therethrough, the fluid being feed into the chamber such that at least a portion of fluid passes through the openings in the disc.

33. A method according to claim 30, wherein an opening is formed in each fin such that an annular fluid equalizing channel provides fluid communication between each of the areas bounded by the fins, the fluid being feed into the chamber of the vessel such that at least a portion of the fluid travels within the fluid equalizing channel.

34. A method according to claim 24, wherein the inlet and the outlet of the vessel encircle the rotational axis or have the rotational axis extending therethrough.

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35. A method for separating particulate matter from a fluid in which the particulate matter is suspended, the method comprising:

feeding into a chamber of a vessel through an inlet in a substantially continuous fashion a fluid containing a particulate matter, the chamber being at least partially bounded by a peripheral wall and the chamber also communicating with an outlet;

rotating the vessel about a rotational axis extending through the vessel such that at least a portion of the particulate matter settles out of the fluid and against at least a portion of the peripheral wall of the vessel;

removing through the outlet of the vessel in a substantially continuous fashion the fluid from which the particulate material has settled out;

temporarily stopping the flow of the fluid through the inlet and the outlet of the vessel;

during the period in which the flow of fluid through the inlet and outlet is stopped, delivering a stream of removal fluid into the rotating vessel at or adjacent to the peripheral wall such that delivery of the removal stream into the vessel causes at least a portion of particulate matter settled against the peripheral wall to resuspend within the fluid contained within the vessel;

removing at least a portion of the fluid having the resuspended particulate matter therein from the vessel; and

once the at least a portion of the fluid having the resuspended particulate matter therein is removed from the vessel, reinitiating the flow of the fluid through the inlet and outlet of the vessel.

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36. A method according to claim 35, wherein the removal fluid is delivered through a plurality of extraction tubes extending from toward the rotational axis to toward the peripheral wall.

37. A method according to claim 35, wherein the fluid having the resuspended particulate matter therein is removed from the vessel through a plurality of extraction tubes extending from toward the rotational axis to toward the peripheral wall.

38. A method according to claim 35, wherein the act of feeding includes the fluid comprising a heavy fluid component and a light fluid component.

39. A method according to claim 35, further comprising pressurizing the fluid within the chamber in a range between about 15 psi to about 600 psi.

40. A method according to claim 35, wherein a plurality of spaced apart fins are disposed within the chamber of the vessel, the fins bounding a plurality of fluid channels that extend between the inlet and the outlet, the fluid being feed into the chamber of the vessel such that at least a portion of the fluid passes through the fluid channels.

41. A method according to claim 40, wherein a disc outwardly projects from toward the rotational axis to toward the peripheral wall, the disc intersecting with each of the plurality of fins, the fluid being feed into the chamber such that fluid is forced to travel around an outer perimeter of the disc.

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42. A method according to claim 40, wherein a disc outwardly projects from toward the rotational axis to toward the peripheral wall, the disc intersecting with each of the plurality of fins and the disc having a plurality of openings extending therethrough, the fluid being feed into the chamber such that at least a portion of fluid passes through the openings in the disc.

43. A method according to claim 40, wherein an opening is formed in each fin such that an annular fluid equalizing channel provides fluid communication between each of the areas bounded by the fins, the fluid being feed into the chamber of the vessel such that at least a portion of the fluid travels within the fluid equalizing channel.

44. A method according to claim 34, wherein the inlet and the outlet of the vessel encircle the rotational axis or have the rotational axis extending therethrough.

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